## ABSTRACT

A self-moisturizing polymer electrolyte membrane (PEM) composition, a membrane-electrode assembly, and a fuel cell. The PEM composition comprises (a) a proton-conducting polymer containing a detachable hydrogen ion and a counter-ion bonded to the polymer; and (b) a deliquescent material for keeping the membrane wet and for detaching the hydrogen ion to facilitate proton transport in the membrane. Alternatively, the deliquescent material may be strategically located on the gas flow field channels, gas-diffusion electrode or backing layers, and/or electro-catalyst layers. A preferred PEM polymer is poly(perfluoro sulfonic acid). This self-moisturizing PEM obviates the need to have a pre-humidifying structure or a complex flow field design in a fuel cell.